

# Modeling and Simulation



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*Dr. Burggraf applies expertise in molecular spectroscopy, surface chemistry, computational chemistry, radiation chemistry, and nuclear measurements to create new capabilities in chemical and nuclear weapons detection, environmental sensors, devices for space photovoltaics and space sensors. He has been on the faculty for since 1993 and has published over 35 technical articles and reports.*



**Kirk A. Mathews**

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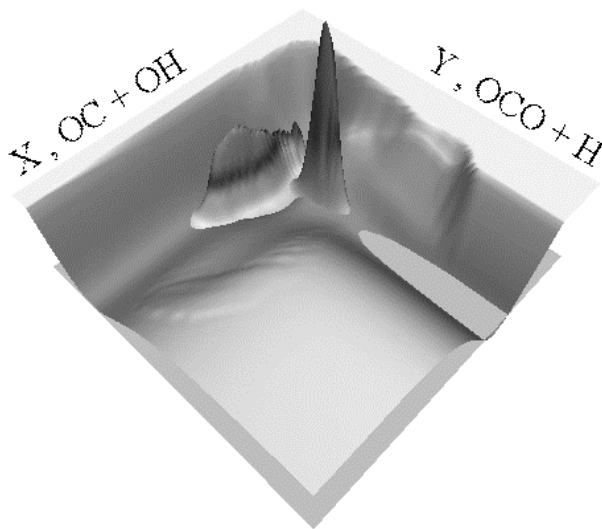
*Dr. Mathews has operational experience in nuclear power, nuclear weapons, and aboveground and underground nuclear weapons effects testing. Since joining the AFIT faculty in 1987, he has advised over two dozen theses and dissertations in a wide variety of military nuclear areas and has published over a dozen journal articles.*

## Research Areas

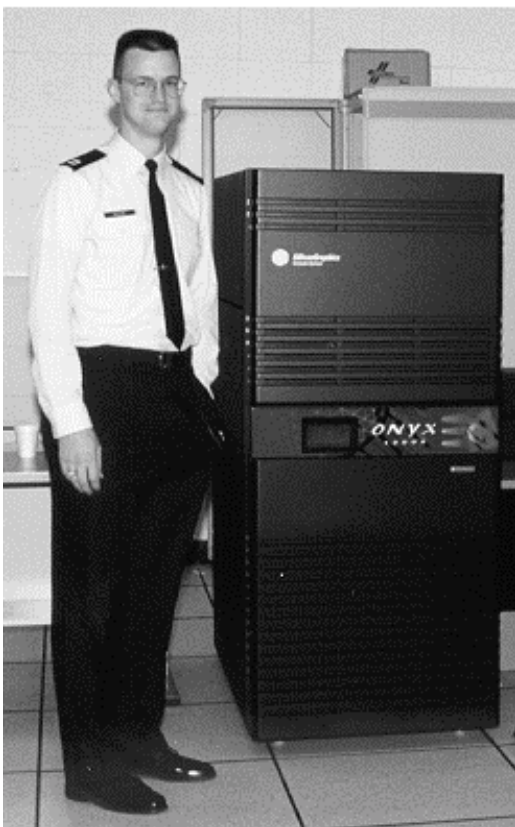
- Radiation Transport
- Computational Chemistry
- Molecular Reaction Dynamics
- Plasma Dynamics
- Space Weather
- Meteorology

## Recent and Ongoing Research

Vigorous activity in a variety of research areas has led to a number of new and exciting results. Highlights include the development of new methods for solving radiation transport equations, a new quantum / classical hybrid approach for modeling surface chemistry, a novel application of wave packet propagation to model non-adiabatic molecular dynamics, and the development of a new generalized 2D model for plasma kinetics. In addition to these accomplishments, significant code validation efforts in the areas of space weather and meteorology have been successfully pursued.



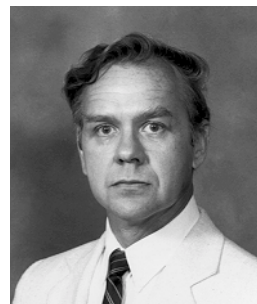
*Wave packet propagation is used to simulate molecular dynamics during a chemical reaction*



*Several high end computational facilities are available for student use.*

## Computational Facilities

A wide variety of computational facilities are available to the Department of Engineering Physics. Departmental facilities range from several high end NT workstations, to a cluster of SGI workstations including five O2s and three dual processor Octanes. Also available are school wide resources including NT and Sun workstations. For larger computational requirements, there is a close collaboration between the Air Force Institute of Technology and the world class ASC Major Shared Resource Center, providing access to state of the art parallel processing capabilities and high end visualization tools.

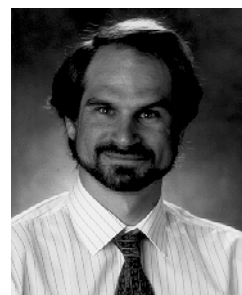


### **William F. Bailey**

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*Dr. Bailey's research interests focus on computer simulations of plasma dynamics. He has served on the Engineering Physics Department Faculty since 1979, is currently the Chairman of the Graduate Applied Physics Program, and has published more than 20 technical articles and reports.*



### **David E. Weeks**

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*Dr. Weeks' research focuses on quantum mechanical wave packet models of molecular reaction dynamics, optical and electronic properties of multi quantum well devices, and the near earth space environment. He has been on the faculty since 1993 and has published over 30 technical articles and reports.*